



SB-3537

M. Sc. (Part-II) Examination

March / April – 2011

5004 : Optimization - Technique

Time : Hours]

[Total Marks : 42

Instructions :

(1)

नीचे दृशावेव निशानीवाणी विगतो उत्तरवडी पर अवश्य वपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="M. Sc. (Part-2)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="5004 : Optimization - Technique"/>	<input type="text"/>
Subject Code No. : <input type="text" value="3"/> <input type="text" value="5"/> <input type="text" value="3"/> <input type="text" value="7"/>	<input type="text"/>
Section No. (1, 2,.....) : <input type="text" value="Nil"/>	<input type="text"/>
Student's Signature	

- (2) Each question carry equal marks.
- (3) Attempt all questions.
- (4) All questions are compulsory

1 (a) Define the following terms in Linear programming : 4

- (i) Optimum Solution
- (ii) Objective function
- (iii) Basic Feasible Solution
- (iv) Constrain

(b) Solve the following example by simplex method : 5

$$\text{Maximize } Z = 7x_1 + 9x_2$$

Subject to

$$4x_1 + 5x_2 \leq 120$$

$$3x_1 + 2x_2 \leq 95$$

$$8x_1 + 3x_2 \leq 70$$

$$\text{where } x_1, x_2 \geq 0$$

OR

1 (a) How will you solve Linear Programming problem by Simplex Method ? 4

(b) Solve the following example : 5

$$\text{Maximize } Z = 4x_1 + 2x_2 + 3x_3$$

$$\text{Subject to } 2x_1 + x_2 + x_3 \leq 22$$

$$3x_1 + 4x_2 + 2x_3 \geq 12$$

$$\text{where } x_1, x_2, x_3 \geq 0$$

2 (a) Formulate the following problem in LPP Form. 4

(i) The company has three operational departments (weaving, processing and packing) with capacity to produce three different types of cloths namely suiting, shirting's and woolens yielding the profits Rs. 2, Rs. 4 and Rs. 3 per meter respectively. One meter suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minutes in packing. Similarly one meter of shirting requires 4 minutes in weaving, 1 minutes in processing and 3 minutes in packing. 1 minute in processing and 3 minutes in packing while one meter woolen require 3 minutes in each departments. In a week, total run time of each department is 60, 40 and 80 hours for weaving, processing and packing departments respectively.

(ii) A farmer has 100-acre farm. He can sell all the tomatoes, lettuce or radishes he can raise. The price he can obtain is Rs. 1 per Kg. for tomatoes, Rs. 0.75 a head for lettuce and Rs. 2 per kilogram for radishes. The average yield per acre is 2000 kilograms of tomatoes, 3000 head of lettuce and 1000 kilograms of radishes. Fertilizer is available at Rs. 0.50 pe kilogram and the amount required per acre is 100 kilograms each for tomatoes and lettuce and 50 kilograms for radishes. Labour required for sowing, cultivating and harvesting per acre is 5 man-days for tomatoes and radishes and 6 man-days for lettuce. A total of 400 man-days of labour are available at Rs. 20 per man-day.

Formulate this problem as linear programming model to maximize the farmer's total profit.

- (b) Use dual simplex method to solve the following LPP : 5

$$\text{Minimize } Z = 6x_1 + 7x_2 + 3x_3 + 5x_4$$

Subject to

$$5x_1 + 6x_2 - 3x_3 + 4x_4 \geq 12$$

$$x_2 + 5x_3 - 6x_4 \geq 10$$

$$2x_1 + 5x_2 + x_3 + x_4 \geq 8$$

$$\text{where } x_1, x_2, x_3, x_4 \geq 0$$

OR

- 2 (a) Define the term "Post-optimality analysis". Discuss the effect of : 4

(i) Discrete change in objective function coefficient c .

(ii) Discrete change in the requirement Vector b .

- (b) Give the linear programming problem 5

$$\text{Maximize } Z = 3x_1 + 5x_2$$

$$\text{Subject to } x_1 + x_2 \leq 1$$

$$2x_1 + 3x_2 \leq 1$$

$$\text{where } x_1, x_2 \geq 0$$

Obtain the variation in c_1 and c_2 which are permitted without changing the optimal solution.

- 3 (a) Divide quantity C into n parts so as to maximize their product. Let $f_n(c)$ be the maximum value. Then show that $f_1(c) = 1$ and $f_n(c) = \max \{ z f_{n-1}(c-z) \} \quad 0 < z \leq c$. Hence find $f_n(c)$ and the division that maximize it. 4

- (b) Use dynamic programming and find minimum value of,

$$\min z = y_1^2 + y_2^2 + y_3^2$$

$$\text{Subject to } y_1 + y_2 + y_3 \geq 15$$

$$\text{where } y_1, y_2, y_3 \geq 0$$

OR

- 3 (a) Describe Gomory's All Integer Cutting Plane Method. 4

- (b) Solve the following LPP by Revised Simplex Method. 4

$$\text{Maximize } Z = x_1 + 2x_2$$

$$\text{Subject to } x_1 + x_2 \leq 3$$

$$x_1 + 2x_2 \leq 5$$

$$3x_1 + x_2 \leq 6$$

$$\text{where } x_1, x_2 \geq 0$$

4 (a) Find the minimum of $f(x) = x^5 - 5x^3 - 20x + 5$ using quadratic interpolation method. 4

(b) Explain Wolfe's method for solving a given NLPP. 4

OR

4 (a) Write general Non-Linear programming problem. 4

Solve the following Non-Linear programming problem

graphically. Maximize $Z = 8x_1 - x_1^2 + 8x_2 - x_2^2$

Subject to

$$x_1 + x_2 \leq 12$$

$$x_1 - x_2 \geq 4$$

Where $x_1, x_2 \geq 0$

(b) Describe Beale's method for solving a given NLPP. 4

5 (a) The efficiency E of a small manufacturing concern depends on the worker W and is given by 4

$10E = -\left(\frac{w^3}{40}\right) + 30w - 39^2$. Find the strength of the workers which gives maximum efficiency.

(b) State and prove theorem for necessary condition for local minimum and maximum value.

OR

5 (a) Describes the steps of solving one Dimensional Non-linear problem using direct method. 4

(b) Solve the following problems by using the method of Lagrangian multipliers. 4

Minimum $Z = x_1^2 + x_2^2 + x_3^2$

Subject to the constrain

$$x_1 + x_2 + 3x_3 = 2$$

$$5x_1 + 2x_2 + x_3 = 5$$

Where $x_1, x_2, x_3 \geq 0$